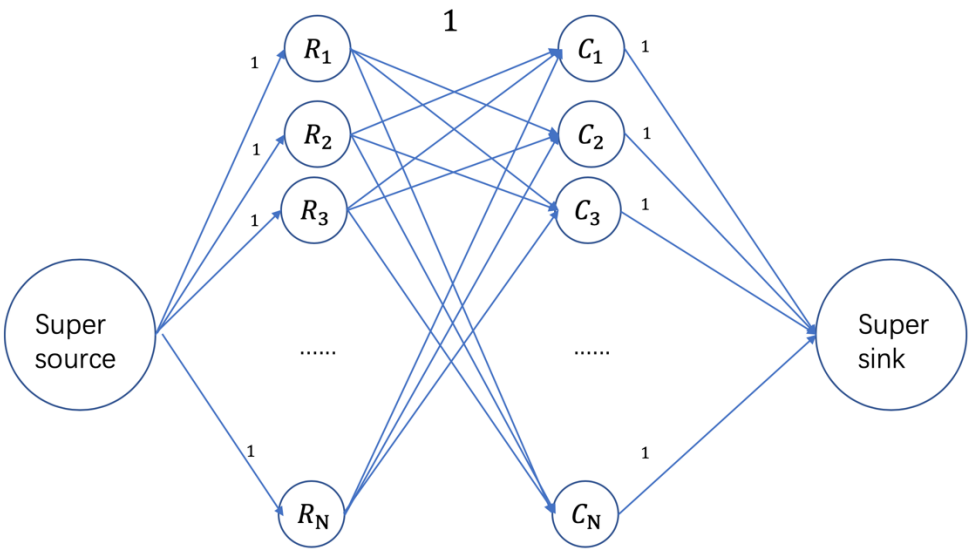
Question2

Solution :

Construct a flow network as a directed graph and it should be bipartite graph:

1. Create a $super\ source$ and has directed edges to each row and each row is a vertex on the left-hand side, that's $\{R_1, R_2, \dots, R_n\}$. All of the directed edges have capacity 1.
2. As mentioned above $\{R_1, R_2, \dots, R_n\}$ are on the left-hand side. Then, each column is a vertex on the right-hand side, that's $\{C_1, C_2, \dots, C_n\}$. For all $i, j \in [1, n]$, there is a directed edge from R_i to C_j with capacity as 1 unless the position $[i, j]$ is under the attack of any of the bishops. For example, if a bishop is at $[1,1]$, then for all $i \in [1, n]$, there cannot be a directed edge from R_i to C_i.
3. Create a $super\ sink$ and each vertex of $\{C_1, C_2, \dots, C_n\}$ has directed edge to the super sink, the capacity of the edge is 1.
4. For example, if there is only one bishop and located at $[i, i]\ for\ i \in [1, n]$, the flow network as below:



5. Compute the maximal flow by Ford-Fulkerson algorithm. The largest number of black rooks you can place on the board is the max flow from $super\ source$ to $super\ sink$.